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IS : 7375 - 1979

Indian Standard
SPECIFICATION FOR SALSEED FAT
(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 1980

Indian Standard

SPECIFICATION FOR SALSEED FAT

(First Revision)

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AMENDMENT NO. 1 SEPTEMBER 1995
TO
IS 7375 : 1979 SPECIFICATION FOR SALSEED FAT

(First Revision)

(*Page* 4, *Foreword, clause* **0.6**) — Add the following clause **0.7** after clause **0.6** and renumber the subsequent clause:

'**0.7** A scheme for labelling environment friendly products to be known as ECO Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF). The ECO Mark shall be administered by the Bureau of Indian Standards (BIS) under the BIS Act, 1986 as per the Resolution No. 71 dated 20 February 1991 as published in the Gazette of the Government of India vide GSR 85(E) dated 21 February 1991. For a product to be eligible for marking with the ECO Mark it shall also carry the Standard Mark of BIS for quality besides meeting additional optional environment friendly (EF) requirements. The EF requirements for salseed fat are therefore being included through an amendment.

This amendment is based on the Gazette Notification No. 678 dated 30 August 1994 for Labelling Edible Oils, Tea and Coffee as environment friendly products, published by the Ministry of Environment and Forests.'

(*Page* 5, *clause* **4.5.1**) — Add the following clauses after clause **4.5.1**:

'**4.6 Optional Requirements for ECO Mark**

4.6.1 *General Requirements*

4.6.1.1 The product shall conform to the requirements of quality prescribed under clauses 4.1 to 4.5.

4.6.1.2 The manufacturers shall produce to BIS environmental consent clearance from the concerned State Pollution Control Board as per the norms laid down under the *Water (Prevention and Control of Pollution) Act*, 1974; *Air (Prevention and Control of Pollution) Act*, 1981; *Water (Prevention and Control of Pollution) Cess Act*, 1977, respectively, along with the authorization, if required under the *Environment (Protection) Act*, 1986, while applying for ECO Mark.

4.6.2 *Specific Requirements*

(*Page* 13, *Fig.* 2) — Add the following Appendix after Fig 2:

'APPENDIX B

(*Clause* 4.6.2.1)

DETERMINATION OF AFLATOXIN

B-1 REAGENTS

B-1.1 Acetone, 70 Percent — 700 ml acetone in 300 ml distilled water.

B-1.2 Acetone, 20 Percent — 200 ml acetone in 800 ml distilled water.

B-1.3 Lead Acetate, 20 Percent — 200 g neutral acetate in distilled water and 3 ml glacial acetic acid, diluted to one litre.

B-2 PROCEDURE

B-2.1 Dissolve 30 g sample in 100 ml hexane.

B-2.2 Extract with 3 × 50 ml 70 percent acetone.

B-2.3 To the extract add 60 ml distilled water and 20 ml lead acetate.

B-2.4 Boil to reduce volume to 150 ml. Cool to about 20°C.

B-2.5 Filter and wash with 20 percent acetone.

B-2.6 Extract filtrate and washings with 3 × 50 ml chloroform.

B-2.7 Pass chloroform layer through anhydrous sodium sulphate.

B-2.8 Concentrate to 50 ml and spot on TLC plate.

B-3 CALCULATION

$$\text{Aflatoxin, mg/kg} = \frac{V \times s \times 1\,000}{v \times m}$$

where

V = volume of extract in ml,

v = volume of extract giving minimum observable fluorescence in µl,

m = mass of sample in g, and

s = standard toxin giving minimum observable fluorescence in µg.'

(FAD 44)

Reprography Unit, BIS, New Delhi, India

4.6.2.1 The product shall not contain aflatoxin, more than 5 mg/kg, when tested by the method prescribed in Appendix B.

4.6.2.2 The pesticide residues, if any, shall not exceed the tolerance limits as prescribed in the *Prevention of Food Adulteration Act,* 1954 and *Rules* made thereunder.

4.6.2.3 Only permitted antioxidants not exceeding the quantities specified against each as prescribed under the *Prevention of Food Adulteration Act,* 1954 and *Rules* made thereunder, shall be used, if required.

4.6.2.4 The product shall not contain any of the toxic metals in excess of the quantities prescribed in Table 2.

TABLE 2 LIMITS FOR TOXIC METALS

Sl No.	Characteristic	Requirement	Method of Test, Ref to
i)	Lead, mg/kg, *Max*	5.0	15 of IS 1699 : 1995*
ii)	Arsenic, mg/kg, *Max*	0.5	do
iii)	Cadmium, mg/kg, *Max*	1.0	do
iv)	Mercury (total) mg/kg, *Max*	0.25	do

* Methods of sampling and test for food colours (*second revision*).

(*Page* 6, *clause* **5.1**) — Add the following clause **5.1.1** after clause **5.1**:

'**5.1.1** For ECO Mark the product shall be packed in such packages which are made from recyclable (that is which can be re-processed to manufacture any useful product) or biodegradable materials.'

(*Page* 7, *clause* **6.2**) — Add the following clause **6.3** after clause **6.2**:

"**6.3** For ECO Mark the containers shall be marked with the following information:

a) List of identified critical ingredients in descending order of quantity, percent by mass, which shall include 'made from salseed fat';

b) The brief criteria for which the product has been labelled for ECO Mark; and

c) Shelf life of the product."

AMENDMENT NO. 2 MARCH 2002
TO
IS 7375 : 1979 SPECIFICATION FOR SALSEED FAT

(First Revision)

(*Amendment No.* 1, *page* 2, *clause* **4.6.2.1**) — Substitute '5 µg/kg' *for* '5 mg/kg '.

(FAD 44)

Reprography Unit, BIS, New Delhi, India

Indian Standard
SPECIFICATION FOR SALSEED FAT
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 26 September 1979, after the draft finalized by the Oils and Oilseeds Sectional Committee had been approved by the Chemical Division Council and the Agricultural and Food Products Division Council.

0.2 Salseed fat is obtained from the seed kernels of sal tree (***Shorea robusta*** Gaertn. f.) widely known as sal in northern India, sal tree is one of the outstanding forest trees of Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, West Bengal and Assam and its other common Indian names are sal (Bengal), ***Belsal, Borsal, Borsar*** (Garo Hills, Assam), ***Sarai*** (M P.) *Salwa, Sekwa, Soringhi, Saragi, Rangal* (Orissa), *Salwa, Tamba, Sariakamu* (Telugu). In Indian literature it is also known as ***Aswakarna.*** The total potential of salseed fat is very large in the country.

0.3 This standard was first published in 1974. Salseed kernels contain up to 18·5 percent of a greenish hard fat. The fat derived from seeds of ***Shorea robusta*** Gaertn. f. is being used as a cocoa butter substitute. The salseed fat has also been traditionally used by local population for edible use. It has been exported to many countries in recent past for use as a cocoa butter substitute. The studies undertaken so far on its suitability for edible uses have been found generally satisfactory. The concerned technical committee, therefore, decided to revise this standard incorporating refined salseed fat for edible uses.

0.3.1 The use of refined salseed fat in the manufacture of bakery and confectionary products is being permitted under the Prevention of Food Adulteration (PFA) Act by Government of India. However, its use for other edible purposes, such as in the manufacture of vanaspati is under active consideration of the Ministry of Health, Government of India.

0.4 The oleic acid content of salseed fat and cocoa butter are almost identical, at around 40 percent. The saturated acids in cocoa butter are palmitic and stearic in roughly equal proportions, thus giving rise to a high proportion of mixed glycerides containing all these three acids. In salseed fat, the saturated acid is almost entirely stearic leading mostly to stearic oleic glycerides. Disaturated glycerides predominate in both fats giving them a certain similarity in properties.

0.5 This standard contains clause **5.1** which calls for agreement between the purchaser and the supplier.

0.6 In the preparation of this revision, substantial assistance has been drawn from data supplied by Directorate of Oilseeds Development, Hyderabad; Hindustan Lever Ltd, Bombay; Khadi & Village Industries Commission, Bombay; Oil Technological Research Institute, Anantapur (AP) and Regional Research Laboratories, Bhubaneswar and Hyderabad and the assistance so derived is thankfully acknowledged.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for salseed fat.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definition given under **2** of IS : 548 (Part I)-1964† and IS : 548 (Part III)-1976‡, and the following shall apply.

2.1.1 *Raw Salseed Fat* — Salseed fat obtained by the process of solvent extraction.

2.1.2 *Refined Salseed Fat* — Salseed fat obtained by the process of solvent extraction which has been neutralized with alkali, bleached with bleaching earth or activated carbon or both, and deodorized with steam, no other chemical agents being used. Alternatively de-acidification, bleaching and deodorization may be done by physical means.

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*Rules for rounding off numerical values (*revised*).

†Methods of sampling and test for oils and fats: Part I Methods of sampling, physical and chemical tests (*revised*).

‡Methods of sampling and test for oils and fats: Part III Analysis by gas liquid chromatography.

3. GRADES

3.1 The material shall be of the following three grades:

a) Refined grade,

b) Raw grade 1, and

c) Raw grade 2.

3.1.1 The material of the refined grade is suitable for edible purposes (*see also* **0.3.1**).

3.1.2 The material of raw grade 1 is suitable for making vanaspati, refined fat and for use in bakery and confectionary products only, and not for direct consumption.

3.1.3 The material of the raw grade 2 is suitable for industrial uses.

4. REQUIREMENTS

4.1 The material shall be obtained from clean and sound seed kernels of sal tree, *Shorea robusta* Gaertn. f. (N.O. Dipterocarpaceae) by the process of solvent extraction.

4.1.1 Solvent-extracted oil shall be obtained from the seed kernels using solvent hexane conforming to IS : 3470-1966*.

4.2 The material of refined grade shall be clear on melting and free from adulterants, rancidity sediment, suspended and other foreign matter, separated water, and added colouring or flavouring substances and shall have acceptable taste and odour. It may contain permitted antioxidants in specified quantities as prescribed under the Prevention of Food Adulteration (PFA) Rules of the Government of India.

4.3 The clarity of the material shall be judged by the absence of any turbidity after keeping the melted filtered sample at 40°C for 24 hours.

4.4 Admixture with Other Oils -- The material shall be free from admixture with mineral oil and other oils when tested according to the methods prescribed in IS : 548 (Part II)-1976†.

4.5 The material of refined grade and raw grade 1 shall also comply with the requirements given in Table 1.

4.5.1 The material of raw grade 2 shall also comply with the requirements given in Table 1 for raw grade 1 except in case of acid value which shall be maximum 20.

---

*Specification for hexane, food grade.

†Methods of sampling and test for oils and fats: Part II Purity tests (*third revision*).

TABLE 1 REQUIREMENTS FOR SALSEED FAT

(*Clauses* 4.5 *and* 4.5.1)

Sl No.	Characteristic	Requirement for		Method of Test, Ref to		
		Refined Grade	Raw Grade 1	Appendix	Cl No.	
(1)	(2)	(3)	(4)	(5)	(6)	
i)	Moisture and volatile matter, percent by mass, *Max*	0·1	1·0	—	5 & 6	of IS : 548 (Part I)-1964*
ii)	Refractive index† at 40°C	1·450 0 to 1·460 0		—	10	
iii)	Acid value‡, *Max*	0·5	12	—	7	
iv)	Iodine value (Wijs)	←35 to 45→		—	14	
v)	Saponification value	←186 to 195→		—	15	
vi)	Titre, °C	46 to 53		—	12	
vii)	Unsaponifiable matter, percent by mass, *Max*	←2·5→		—	8	
viii)	Flash point, Pensky-Martens (closed), °C, *Min*	250	100	—	IS : 1448 [P : 21]-1970§	
ix)	9, 10 epoxy and 9, 10 dihydroxy stearic acids, percent by mass, *Max*	3·0	—	A	—	

*Methods of sampling and test for oils and fats: Part I Methods of sampling physical and chemical tests (*revised*).

†This corresponds to B. R. reading of 36·7 to 51·0.

‡The corresponding figure in terms of free fatty acids (FFA) when expressed as oleic acid shall be maximum 0·25, 6 and 10 percent by mass for refined, raw grade 1 and raw grade 2 of salseed fat respectively.

§Methods of test for petroleum and its products: P : 21 Flash point (closed) by Pensky-Martens apparatus (*first revision*).

5. PACKING

5.1 The material shall be packed in suitable well-closed containers as agreed to between the purchaser and the supplier. The refined grade of salseed fat shall be packed in new tin containers.

6. MARKING

6.1 The containers shall be marked with the following information:

a) Name and grade of the material;

b) Net mass of the material;

c) A statement that permitted antioxidants have been used, if added;

d) Manufacturer's name and his recognized trade-mark, if any;

e) Batch number or lot number in code or otherwise; and

f) Month and year of manufacture.

6.1.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6.2 In addition, in case of raw grades of the material following information shall also be suitably marked, either printed on the label affixed to the container or lithographed or stencilled thereon with indelible ink in a type size of not less than 50 mm:

a) Raw grade 1 — 'NOT FOR DIRECT EDIBLE USE'

b) Raw grade 2 — 'FOR INDUSTRIAL NON-EDIBLE USES ONLY'

7. SAMPLING

7.1 Representative samples of the material shall be drawn as prescribed under **3** of IS : 548 (Part I)-1964*.

7.2 All the characteristics given in this specification shall be tested on the composite sample.

7.3 The lot shall be declared as conforming to the requirements of this specification, if all the test results on the composite sample satisfy the requirements given in **4**.

---

*Methods of sampling and test for oils and fats: Part I Methods of sampling, physical and chemical tests (*revised*).

8. TESTS

8.1 Tests shall be carried out as prescribed in IS : 548 (Part I)-1964*, IS : 548 (Part II)-1976†, IS : 1448 [P : 21]-1970‡ and Appendix A. Reference to the relevant clauses of IS : 548 (Part I)-1964*, IS : 1448 [P : 21]-1970‡ and Appendix A is given in col 5 and 6 of Table 1 and that of IS : 548 (Part II)-1976† in **4.4**.

8.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977§) shall be used in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis.

APPENDIX A

[*Table* 1, *Item* (ix)]

ESTIMATION OF EPOXY AND DIHYDROXY STEARIC ACIDS

A-0. GENERAL

A-0.1 Two methods have been prescribed. The method given in **A-1** shall be used as a referee method whereas the method given in **A-2** may be used for routine analysis.

A-1. ESTIMATION BY GAS LIQUID CHROMATOGRAPHY (GLC)

A-1.0 Outline of the Method — The method consists of enrichment of triglycerides containing 1 mole of 9,10-epoxy stearic acid and 2 moles of predominantly stearic acid (designated as P) and other triglyceride containing 9,10-dihydroxy stearic acid in place of epoxy stearic acid (designated as Q) from a known mass of salseed fat by treatment with silicic acid in hexane and desorbing these by a more polar solvent. The desorbate to which a known quantity of internal standard is added is subjected to transmethylation, and the methyl esters after silylation analyzed by GLC.

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*Methods of sampling and test for oils and fats: Part I Methods of sampling, physical and chemical tests (*revised*).

†Methods of sampling and test for oils and fats: Part II Purity test (*third revision*).

‡Methods of test for petroleum and its products: P : 21 Flash point (closed) by Pensky-Martens apparatus (*first revision*).

§Specification for water for general laboratory use (*second revision*).

A-1.1 Procedure

A-1.1.1 *Enrichment of 'P' and 'Q' and Transmethylation* — Dissolve 200 mg of refined salseed fat in 2 ml of *n*-hexane and stir with 600 mg of silicic acid (activated at 110°C for 1 hour before use) for 1·5 hours using a magnetic stirrer. Pipette out the supernatant hexane and wash the residue with additional 2 ml of hexane and discard the hexane. Add 2 ml of chloroform methanol (3 : 1) (*v/v*) mixture to the residual silicic acid and stir for 45 minutes. Filter the contents and wash the residue with additional 2 × 2 ml chloroform-methanol mixture (3 : 1) (*v/v*) to ensure complete desorption of the adsorbed material. Add a known amount of about 2 mg of *n*-heptadecanoic acid methyl ester to the combined chloroform-methanol filtrate contained in a 10 ml round bottom flask and evaporate solvent to dryness under a stream of nitrogen. Dissolve the residue in 1 ml of dichloromethane and retreat it with 2 ml of 2 M solution of sodium methoxide in methanol and keep at 50°C for 15 minutes with occasional shaking. During this treatment connect the flask to a condenser and calcium chloride guard tube. Dilute the contents with 2 ml saturated sodium chloride solution and extract with *n*-hexane (3 × 2 ml) in a separating funnel. Wash the combined hexane extract with water to ensure complete removal of alkali (by *p*H paper), dry over anhydrous sodium sulphate and evaporate to dryness under nitrogen.

A-1.1.2 *Silylation* — Transfer the final residue to a 5 ml screw-capped vial with the aid of ether and subsequently remove the ether by evaporation under nitrogen. Dissolve this in 0·2 ml of dry pyridine and treat with 0·1 ml of hexamethyldisilazane and 0·05 ml of chlorotrimethylsilane and keep at room temperature for 1 hour. Evaporate the reagents to dryness on a water bath at about 50°C under nitrogen.

A-1.1.3 *GLC Analysis* — Dissolve the residue obtained in **A-1.1.2** in hexane and inject into GLC column. The details of the instrument and conditions [*see also* IS : 548 (Part III)-1976*] shall be as follows:

a) Detector : Flame ionization detector (FID)
b) Column : 2·5 M × 4 mm glass; 1 percent OV-17† on 80 to 100 mesh Gas Chrom *Q*
c) Temperature of inlet oven and detector : 195°C
d) Chart speed : 25 cm/h
e) Nitrogen flow : 60 ml/min

---

*Methods of sampling and test for oils and fats: Part III Analysis by gas liquid chromatography.

†Supplied by Applied Science Laboratories, Pennsylvania, USA or equivalent.

A-1.2 Calculation

A-1.2.1 A typical GLC scan is shown in Fig. 1 in which the peaks due to methyl esters of epoxystearic acid and silylated dihydroxy-stearic acid are marked. Calculate the amount of '*P*' and '*Q*' as follows (*see* Note):

$$\text{'}P\text{', percent by mass} = \frac{\text{Peak area of epoxy acid methyl ester}}{\text{Peak area of the internal standard}} \times \text{Amount of internal standard in mg} \times \frac{904^{*}}{312} \times \frac{100}{\text{mass of sample in mg}}$$

$$\text{'}Q\text{', percent by mass} = \frac{\text{Peak area of dihydroxy}^{\dagger}\text{ methyl ester}}{\text{Peak area of the internal standard}} \times \text{Amount of internal standard in mg} \times \frac{922^{\ddagger}}{330} \times \frac{100}{\text{Mass of sample in mg}}$$

NOTE — The GLC method of '*P*' and '*Q*' estimation is applicable to refined fat or fats with free fatty acids (FFA) less than 2 percent. In case of high FFA fat, neutralization should precede transesterification. For this purpose spray a small quantity of fat with 3 N sodium hydroxide (10 percent excess) containing 10 percent sodium chloride at 50 to 60°C under gentle stirring. After allowing the soap to settle for a while transfer the material to a tube and then centrifuge. Wash the supernatant oil free from soap and take for transesterification.

A-1.2.2 Epoxy and dihydroxy fatty acids, percent by mass $= \dfrac{P + Q}{3}$

A-2. ESTIMATION '*P*' AND '*Q*' BY PREPARATIVE THIN LAYER CHROMATOGRAPHIC (TLC) METHOD

A-2.0 Outline of the Method — '*P*' and '*Q*' are separated on preparative TLC plates and the bands scraped, extracted with solvent, evaporated and weighed. This method is applicable to fats containing approximately 3 percent each or more of '*P*' and '*Q*'. Fats containing lesser proportions of '*P*' and '*Q*' need enrichment prior to preparative TLC in order to get reasonable amount of '*P*' and '*Q*' for weighing. This method works well with refined fats or raw fats with FFA 3 percent and below, but fats with high FFA should be refined (*see* Note under **A-1.2.1**).

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[*] The molecular mass of '*P*' calculated on the basis of 2 moles of stearic acid and 1 mole of the epoxy acid in one mole of triglyceride.

[†] Measured peak area of the disilyl derivative is multiplied by a factor 0·7 which is the ratio of molecular mass of dihydroxy ester to the disilyl derivative. This figure is divided by detector response factor, 0·95, to get the actual peak area of dihydroxy ester.

[‡] The molecular mass of '*Q*' calculated on the basis of 2 moles of stearic acid and 1 mole of the dihydroxy acid in 1 mole of triglyceride.

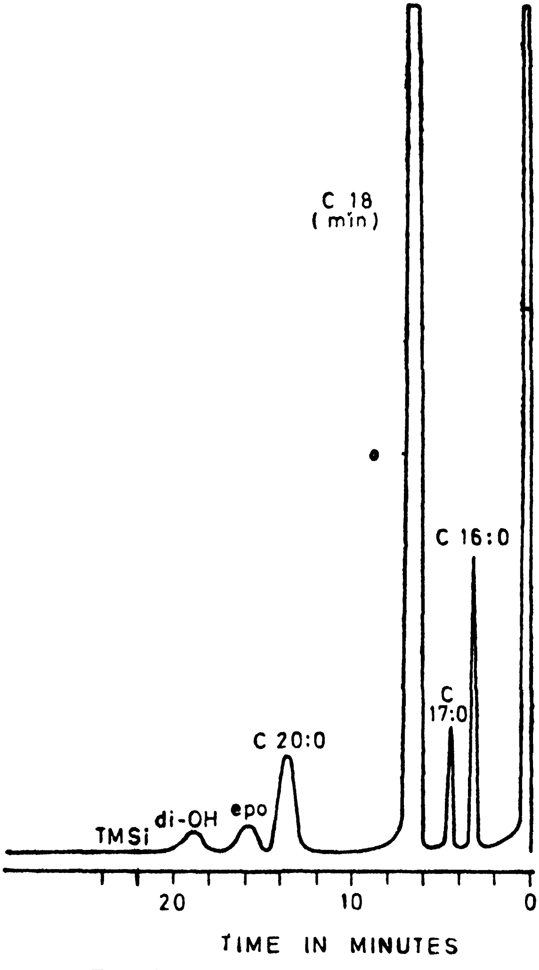

FIG. 1 TYPICAL GLC SCAN

A-2.1 Procedure

A-2.1.1 Weigh accurately about 10 g of salseed fat and dissolve in 100 ml of hexane and stir with 20 g of silicic acid* for 4 hours on a magnetic stirrer. Filter the slurry using a Buchner funnel and distil the filtrate to obtain the normal triglycerides. This fraction does not show the presence of '*P*' or '*Q*' when 2 mg of the material is chromatographed on a TLC plate indicating that '*P*' and '*Q*' are completely adsorbed (*see* Note).

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*BDH laboratory reagent grade for lipid chromatography or any other silicic acid of equivalent grade activated at 110° for 1 hour before use may be used.

NOTE — In case of silicic acid from other sources, it is necessary to do this TLC test to ensure absence of '*P*' and '*Q*' in the hexane extract and to arrive at the appropriate fat: silicic acid ratio. For instance a ratio of 1 : 1 was found suitable with silicic acid from another source.

A-2.1.2 Stir the residual silicic acid with 100 ml of chloroform for 1 hour and filter. Repeat the operation with a fresh lot of 100 ml of chloroform. Distil the combined filtrate to obtain the enriched fraction.

A-2.1.3 Dissolve a known mass (80 to 90 mg) of the enriched fat in 0·5 ml of chloroform and apply as a streak on a preparative plate of 1 mm thick silica gel and develop four such plates using hexane, ether and acetic acid (60 : 40 : 1) as a solvent system. Visualize the bands in an iodine chamber (*see* Fig. 2 for typical chromatogram) and scrape the bands at R_f 0·84 and 0·28 corresponding to '*P*' and '*Q*'. Transfer quantitatively into two separate thimbles and extract with chloroform in a Soxhlet. It takes about 1 hour for extraction. After extraction, distil the chloroform and transfer the residue carefully through a Whatman filter paper No. 42 (or equivalent) to a tared 5 ml round-bottom flask using ether. Wash the filter paper thoroughly with ether and collect the washings in the same flask. Evaporate ether under a stream of nitrogen and weigh the flask to a constant mass by keeping it in an oven at 105°C.

A-2.2 Calculation

A-2.2.1 Calculate the amount of '*P*' and '*Q*' in the original fat from the mass of the residue. Express the results as percentage of epoxy and dihydroxy fatty acids by dividing the sum of '*P*' and '*Q*' by 3 (*see also* Notes 1 and 2).

NOTE 1 — The specified solvent system (hexane : ether : acetic acid : : 60 : 40 : 1) is satisfactory for resolving '*Q*' but the resolution of '*P*' from normal triglycerides is occasionally poor and appears to depend on the activity of silica gel. The close R_f values of '*P*' and normal triglycerides is then likely to lead to errors in estimation of '*P*'. In such cases a slightly less polar solvent system (hexane : ether : acetic acid : : 80 : 20 : 1) will lead to a good resolution; '*P*' and '*Q*' should then be determined separately using appropriate solvent systems.

NOTE 2 — Generally, the pattern of separation of various constituents in descending order of R_f on the plate is as follows:

a) Normal triglycerides;

b) '*P*';

c) FFA;

d) 1, 2-diglycerides;

e) 1, 3-diglycerides;

f) '*Q*'; and

g) Monoglycerides.

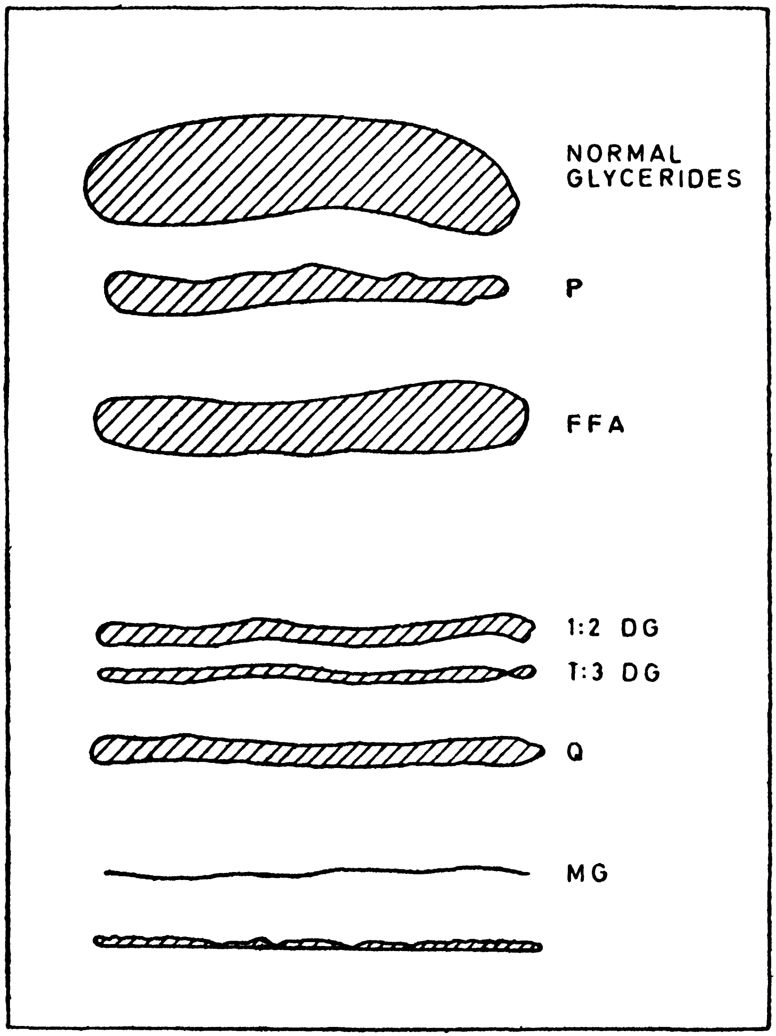

Fig. 2 A Typical Chromatogram of Salseed Fat in Hexane : Ether : Acetic Acid (60 : 40 : 1)

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones : 26 60 21, 27 01 31 **Telegrams : Manaksanstha**

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